evidence that nothing is intended beyond a current field manual for work of the most general character.—JOHN GAYLORD COULTER.

DR. CARL HOLTERMANN[12] has just published, with the assistance of the Royal Prussian Academy of Science in Berlin, an elaborate account of his mycological studies in Java and Ceylon. The morphology and in many cases life-histories of some forty forms, chiefly Basidiomycetes, are described and illustrated with a dozen fine plates. Two new genera, *Oscarbrefeldia* and *Conidiascus*, and one new species, *Ascoidea saprolegnioides*, are added to the Hemiasci. The author is not willing to follow strictly Brefeld's views in respect to the derivation of the conidium from the sporangium. His studies upon the tropical forms indicate that the two structures may be phylogenetically quite independent of one another. He believes that each has its own *Anlage*, and that the direct influence of external conditions determines the development of one or the other or both upon the same mycelium.—BRADLEY MOORE DAVIS.

PARTS 175 and 176 of Engler and Prantl's *Die natürlichen Pflanzenfamilien* contain the completion of the Umbelliferæ by Drude, and the Cornaceæ by Harms. This completes the Archichlamydeæ, a cause for congratulation among taxonomists. The parts of this great work have been noticed briefly from time to time, as they appeared, and the general purpose and its execution warmly commended. It is certainly an epochal work, and supplies a much needed compact and illustrated presentation of known genera. The breadth of the plan has not been approached by any other "Genera Plantarum." The necessity of bringing together the work of so many collaborators has made the editorial work onerous, and of course there is great unevenness of presentation. It is impossible to criticise such a work in general. The students of different groups must pass judgment upon the work in their particular fields.—J. M. C.

NOTES FOR STUDENTS.

BY GROWING plants of Indian corn from sterilized seeds in sterile nutrient fluid, to which he had added glucose, Laurent has determined that their roots are capable of absorbing organic matter in this form.[13]—C. R. B.

MR. DAVID WHITE[14] has described and figured a new lepidodendroid genus, *Omphalophloios*, from the Lower Coal Measures of Missouri, founded upon the problematic *Lepidodendron cyclostigma* of Lesquereux.—J. M. C.

[12] HOLTERMANN, CARL: Mykologische Untersuchungen aus den Tropen. 4to. pp. viii + 122. *pl. 12.* Berlin: Gebrüder Borntraeger. 1898. *M.* 25.

[13] Comptes Rendus —: 887. 1897.

[14] Bull. Geol. Soc. Amer. 9: 329–342. *pls. 20–23.* 1898.

DR. J. WIESNER has published [15] a short paper on *Heliotropism produced by diffuse daylight.* In this paper he lays emphasis upon the fact that although the plant parts possess often an enormous capacity for heliotropic reaction, they always react to the strongest light, although illuminated by diffuse light and, therefore, impinged upon by rays from all sides. It thus comes about that the heliotropic organ places itself so as to divide symmetrically the area from which the light comes. The immediate cause of this is to be found in the fact that the direction is determined by those impulses which are not counteracted by exactly equivalent impulses.—C. R. B.

A PAPER by Hermann Barth has been running for some weeks in the Botanisches Centralblatt entitled *Studies upon the micro-chemical recognition of alkaloids in commercial drugs.* Barth finds the alkaloids in all parts of the drugs; as for example, in the pericarp of *Conium maculatum;* in the seed coats in *Peganum Harmala* and *Colchicum autumnale;* in endosperm of *Areca Catechu;* in both endosperm and embryo of *Aconitum Napellus,* and in the embryo alone of *Physostigma venenosum.* He concludes from the occurrence of the alkaloids that it is to be expected that their functions must be very various. When they occur in the periphery of the plant organs as excretions it is reasonable to suppose that they are then protective substances against the eating of such parts by animals. Those occurring in the endosperm and embryo serve, according to Heckel, as reserve foods. In most cases, however, it appears to be beyond doubt that the alkaloids are to be considered excretions, as has been commonly believed. Some useful reactions for the recognition of alkaloids are described.—C. R. B.

DR. A. NESTLER has presented to the Imperial Academy of Sciences in Vienna a memoir on "The traumatropic movement of the nucleus and protoplasm." A summary of the results as given in the *Botanisches Centralblatt* 76: 43. 1898 is as follows: The different orientation of the nucleus and protoplasm produced by wounding is a very common and probably general phenomenon among plants. It has been observed in monocotyledons, dicotyledons, and algæ, and occurs in like fashion in leaves, stems, and roots. The orientation exhibits itself in a few hours after wounding by the movement of the nucleus and protoplasm close to that wall which is nearest the surface of the wound. The maximum stimulation was observed in most cases after two or three days. The return of the nucleus and protoplasm to their normal position is less definite. In some cases it was observed after five or six days, in other cases they appeared to remain fixed even in the intact cells immediately bounding the wound. This transposition, which according to Tangl may be designated as traumatropic, cannot be explained upon mechanical grounds, but seems to be a peculiar stimulation movement, not more exactly definable, which is connected with the living protoplasts. The trans-

[15] Berichte d. deuts. botan. Gesells. 16: 158–163. 1898.

mission of the stimulus is observed with diminishing strength to the distance of 0.5 to 0.7^{mm} from the wound. The movement takes place in similar manner in the air and in the water. It is influenced by light and perhaps also by temperature; no influence of gravity could be determined. In the guard cells of the stoma the transposition was never observed. In some cases the effect of the stimulation caused the nuclei to increase considerably in size.—C. R. B.

ITEMS OF TAXONOMIC interest are as follows: Miss Alice Eastwood has published (*Proc. Calif. Acad. Sci.* III. (Botany) 1:89–146. 1898) a second fascicle of her "Studies in the herbarium and the field." A study of a collection of eighty or more species of plants from San Nicolas island results in the description of nine new species and three varieties, the new species belonging to Abronia, Astragalus, Hosackia, Peucedanum, Amsinckia, Lycium, Plantago, and Malacothrix. Three new species of Cnicus from southern Colorado and Utah are described. Two new species of Synthyris from the alpine region of southwestern Colorado are added to the solitary alpine species heretofore recognized as occurring in the mountains of Colorado. Two new species of Eriodictyon are recognized as having been included heretofore under *E. tomentosum*. New species of Pacific coast plants are described under Campanula, Romneya, Sedum, Cercocarpus, and Calochortus.—In the *Journal of Botany* (36: 361–378. 1898) S. Schönland and E. G. Baker describe twenty-six new species of Crassula from South Africa, and R. Schlechter publishes a ninth decade of new plants from the same region. —In the current number of the *Bulletin of the Torrey Botanical Club* (25:521–541. 1898) Dr. L. M. Underwood begins a series of papers upon American ferns, the initial number dealing with the ternate species of Botrychium, fifteen of which are recognized, and two described as new, one (*B. Coulteri*) from the Yellowstone National Park, the other (*B. occidentale*) from British Columbia.—J. M. C.

A CAREFUL investigation of the phenomena of fertilization in Onoclea[16] by Mr. W. R. Shaw has brought some interesting facts to light. All previous accounts of fertilization in plants agree in making it consist of the fusion of two germ-nuclei in the resting condition; and similar descriptions are given by zoologists of fertilization in animals. In Onoclea, however, the sperm-nucleus does not pass into a resting condition before uniting with the egg-nucleus, but enters the latter without visible change either of form or structure. Within the egg-nucleus it slowly enlarges and becomes granular before the final building of the nuclear substances. Mr. Shaw was not able to determine with certainty the fate of the cilia and band of cytoplasm, which, together with the nucleus, make up the spermatozoid; though from certain appearances he conjectures they are left outside the egg-nucleus. This con-

[16] Annals of Botany 12:261–285. 1898.

jecture he has confirmed more recently in the case of Marsilia[17] in which the behavior of the sperm-nucleus is as in Onoclea, and the cilia and cytoplasmic band are unmistakably thrown off in the cytoplasm of the egg.

Another result of Mr. Shaw's investigation is well worthy of note. Contrary to what has been seen in many cases and assumed in others, there was no evidence that a membrane is immediately formed about the oosphere after the entrance of the spermatozoid. It is suggested that in Onoclea the exclusion of other spermatozoids is accomplished, not by a membrane but by plasmolysis of the oosphere.

It is highly desirable that further observations should be made on the process of fertilization in zoidogamic plants.—WILSON R. SMITH.

A NEW SPECIES of the genus *Pleodorina* Shaw has been described and figured by Kofoid in the *Bulletin* of the Illinois State Laboratory 5:273. 1898, and named *Pleodorina Illinoisensis.*[18] The account of the structure and habits of the species is very full and interesting. *P. Illinoisensis* is distinguished chiefly from Shaw's *P. Californica* because the vegetative cells are always four in number at the anterior end of the cœnobium instead of constituting about one-half of the cell colony. The number of cells in the cœnobium is also smaller, usually 32 instead of 64 or 128, and the reproductive cells (gonidia) are two or three times the diameter of the vegetative cells instead of being only slightly larger or twice as large as in the Californian species.

Pleodorina Illinoisensis is found in the back waters that cover submerged lands along the Illinois river. Quantitatively it does not form an important part of the plankton, and is not as abundant as Eudorina. Dr. Kofoid realizes that in the incompleteness of our knowledge of the life history of Pleodorina we cannot be sure that it is not a form of *Eudorina elegans.* There is extensive variation in both species, and such similarity of form and measurements that the younger stages of the two are indistinguishable. The presence of four vegetative cells at one pole of the cœnobium is the characteristic mark of *Pleodorina Illinoisensis,* the remaining 28 cells becoming reproductive. In *Eudorina* the antherozoids are formed in a similar group of four cells at one end of the cell colony, and the remaining 28 cells become oospheres. If *Eudorina* should have a parthenogenetic phase among its polymorphic conditions we should expect those 28 cells to be reproductive (gonidia), and the group of four at the anterior pole might remain vegetative. Such a form, if it existed, would be identical with *Pleodorina Illinoisensis.*—BRADLEY MOORE DAVIS.

THE MOST IMPORTANT series of exsiccati for American mycological students so far issued has come to a close with the thirty-sixth volume of

[17] Berichte d. deuts. bot. Gesells. 16:177–184. 1898.

[18] The form of the specific name is barbarous!—EDS.

Ellis and Everhart's *North American Fungi*,[19] which appeared a short time ago. For twenty years the work has been issued with an average regularity and a uniformity in make up and quality rarely attained.

The immediate cause of the discontinuance of the work is the sad illness of one whose name never appears in connection with its publication, but whose untiring zeal and labor have contributed largely to its success. The volumes for the whole series (except the first installment of sixty copies) have been made by Mrs. Ellis, the packets folded and the specimens put in place by her; and we may well believe that without her assistance and encouragement this splendid contribution to American mycology would never have been realized.

The last issue, like each of the preceding ones, contains 100 specimens of dried fungi belonging to various groups, placed loosely in folded packets and provided with printed labels. These are attached to the leaves of a volume containing title page and table of contents. The labels occasionally bear brief critical notes, and still more seldom diagnostic characters. The naming of the specimens has been done with care, and if errors occur, they are few and unavoidable.

The *Fungi Columbiani*, by the same authors, of which thirteen centuries have been issued and which have been, heretofore, a sort of duplicate of the N. Am. Fungi, will hereafter contain species that have not yet appeared in that work, and will thus in a measure be a continuation of it. The packets in this work are not fastened into volumes.—J. C. A.

S. HIRASÉ'S second paper on *Gingko*[20] adds an important contribution to the subject of spermatozoids in gymnosperms. The development of the pollen grain, pollen tube and antherozoid are treated in detail. Three cells are cut off in succession from the main body of the pollen grain. The first of these is soon resorbed; the second persists but does not seem to take any active part in the processes which follow; the third divides into a "stalk cell" and a "body cell." As the body cell increases in size two attractive spheres appear at the poles of its nucleus and somewhat later two larger spherical bodies resembling nucleoli are found between the attractive spheres and the nucleus. These bodies which are surrounded by a dense mass of granules may possibly aid nutrition but further investigation is necessary before anything definite can be said of their physiological or morphological value. The body cell divides parallel to the long axis of the pollen tube, giving rise to two cells in which the antherozoids are organized. A beak put out by the nucleus becomes joined to the centrosome which then makes three spiral

[19] ELLIS, J. B. and EVERHART, B. M.—North American Fungi. 2d Ser. Cent. 36. Pub. by the editors, Newfield, N. J. 1898. $7.00.

[20] Études sur la fécondation et l'embryogénie du Gingko biloba. Jour. of the Tokyo Coll. of Science **12**: 102–149. 1898.

turns in the cytoplasm, in this process becoming drawn out into a spiral band along the edges of which cilia are developed. The antherozoids escape from the mother cell and swim freely in the liquid contained in the pollen chamber. According to Webber the antherozoids in Zamia are themselves ciliated mother cells and the pollen chamber contains air only.

Antherozoids in gymnosperms have now been described by Hirasé[21] in *Gingko biloba*, by Ikeno[22] in *Cycas revoluta* and by Webber[23] in *Zamia integrifolia*. All three find a pair of spherical bodies in the cell which is to give rise to the two antherozoids. Hirasé and Ikeno agree in calling these bodies centrosomes but Webber not believing that they are centrosomes calls them centrosome-like bodies, and later proposes the term blepharoplast. Bodies probably homologous with these centrosomes or blepharoplasts have recently been described by Belajeff and Shaw in several pteridophytes. While Gingko, Cycas and Zamia resemble each other in the general development of their pollen grain structures they present considerable variation in details, especially in the history of the body cell and the formation of the antherozoid.

These investigations have added so much to the evidence accumulating from other sources, that Engler has removed Gingko from the conifers and put it by itself in the Gingkoales, a group coordinate with cycads, conifers and gnetums.—CHAS. J. CHAMBERLAIN.

NUCLEAR DIVISION IN SPIROGYRA has been studied for a long time and the most contradictory results have been obtained, especially in regard to the chemical nature of the nucleolus and its rôle in karyokinesis. Some claim that the nucleolus is fully analogous with that of the higher plants, while others think it very different both in chemical composition and its rôle in karyokinesis. Some believe that the nuclear plate is formed exclusively at the expense of the chromatic network of the nucleus, others that it comes from the nucleolus and still others that it is formed partly from the nuclear network and partly from the nucleolus. The origin of achromatic parts is also in dispute, some claiming a cytoplasmic origin, others a nuclear origin and still others a mixed origin partly cytoplasmic and partly nuclear.

L. Mitzkewitsch[24] has recently presented a thorough discussion of previous literature and added a most important contribution to the subject. The most modern killing and fixing agents were employed. After washing in water, alcohol was added to the water drop by drop at intervals of a minute or more until the material was dehydrated. The transfer from alcohol to xylol and from xylol to paraffin was equally gradual.

The investigations deal almost exclusively with the nucleolus and the

[21] *Loc. cit.* and Bot. Cent. **69**: 33–35. 1897.
[22] Flora **85**: 1. 1898 and Bot. Centralbl.
[23] BOT. GAZ. **23**: 451–459 and **24**: 16–22, 225–235. 1897.
[24] Ueber die Kerntheilung bei Spirogyra. Flora **85**: 81–124. 1898.

achromatic parts of the mitotic figure. *Spirogyra subæqua* and *S. jugalis* were the principal forms studied. The sequence in *S. subæqua* is as follows: The resting nucleus has a large nucleolus surrounded by a very evident nucleolar membrane and the threads of the nuclear network are very faint. As division begins the nucleus elongates, the nucleolus loses its membrane and puts out processes which extend to the periphery of the nucleus. At this stage striations are distinctly visible in the plasma heaps at the poles of the nucleus. The nucleolar processes are now withdrawn and the nucleolus shows a differentiation into intensely staining granules and a less deeply staining ground substance. Achromatic threads now appear inside the nucleus and represent a continuation of the achromatic threads outside. The granules continue to stain more deeply and the nuclear membrane disappears, beginning at the poles of the nucleus. The granules, or chromosomes, become arranged in a single layer in the nuclear plate, while the less deeply staining substance takes the form of bows with sides resting on the chromosomes and the apices, to which the achromatic threads are attached, turned toward the poles. The chromosomes split and as the halves of the nuclear plate separate, granular threads connect them for a time.

After the formation of a new nuclear membrane the material of the nuclear plate still shows the intensely staining chromosomes imbedded in a less deeply staining mass from which processes reach to the nuclear membrane. The processes are gradually withdrawn, the chromosomes gradually become indistinguishable from the rest of the mass, the nucleolar membrane appears and the nucleolus assumes the ordinary aspect of the resting condition.

The other species studied differed only in unessential details.—CHAS. J. CHAMBERLAIN.

A MONOGRAPH of the Caulerpaceæ [25] has recently appeared from the *Annales* of the Botanical Garden of Buitenzorg. Madame Weber-Van Bosse presents a complete taxonomic account of these interesting plants, based upon a personal and very extensive examination of the various scattered herbaria. There is perhaps no group of algæ more difficult to handle than the caulerpas, and the skill with which the author has reduced the immense number of described forms and varieties to sixty-four species is admirable. The specific descriptions seem excellent and fifteen fine lithographic plates greatly assist the reader. One must regret, however, the absence of an index to species and synomyms, for an index, although a clerical detail, is indispensable to the complete usefulness of such a work.

It is exceedingly interesting that this genus Caulerpa, immense in the number and diversity of its varieties, and cosmopolitan in its distribution through the warmer waters of the globe, should apparently reproduce itself

[25] WEBER-VAN BOSSE: Monographie der Caulerpes. Ann. d. Jar. Bot. d. Buitenzorg 15: 243–401. 1898.

entirely vegetatively. No zoospores have ever been seen, the supposed observations of Montagne and Gardiner apparently having been erroneous.—BRADLEY M. DAVIS.

AT THE MEETING of the Academy of Science of St. Louis on the evening of October 17, 1897, Mr. C. H. Thompson spoke of some interesting stylar movements of certain Marantaceæ connected with their pollination. In the course of his remarks Mr. Thompson said:

"Generally speaking, the flower of Marantaceæ is a more or less evident tube, with the calyx and corolla inconspicuous and the stamens changed into irregular petaloid staminodia, except a single fertile one. My studies of the order have been confined to three genera, Maranta, Calathea, and Thalia, and refer to about eight or ten species. In all of the species, one of the staminodia is developed into a keel-like structure, not unlike the keel of a papilionaceous leguminous flower. At maturity of the flower, this keel holds within its fold the style. On one margin of the keel, about midway between the apex and the base of the staminodium, is developed a tentacle-like body which is extremely irritable. This tentacle, in the open flower, guards the passage to the nectary. If the tentacle is irritated, the impulse is conveyed to the sheathing basal portion of the keel, which holds the style, opening the sheath and allowing the style to escape its embrace. This movement of the style is probably due to the unequal turgescence in the cells between those of the upper side and those of the lower side of the style, the greater turgescence existing in the latter. This, when the style is liberated, causes it to curve upward with considerable force. In Maranta the style forms a semicircle, coming to rest with the stigma firmly pressed against the upper staminodium. In Calathea and Thalia it makes a complete spiral revolution, bringing the stigma, in the former, into firm contact with the style, and in the latter placing it securely in a pocket formed by a fold of the inner wall of the upper staminodium. In each instance, the contact is so secure that the stigma can be reached only by destroying the flower. The sensitive tissues seem to be located in the outer cell structure of the sheathing base of the keel. An irritation from an outside agency directed against the tentacle is conveyed by that organ to the sensitive tissue, causing the sheath to open, and liberating the style, which it has been holding under great tension.

"This complicated differentiation of the flower is undoubtedly an adaptation to insure cross-pollination. To understand this better, a detailed description of the essential organs is desirable. In the flower bud the stamen lies parallel with the pistil, with its one-celled anther placed just back of the stigma and on the style. Immediately preceding the opening of the flower, the anther dehisces, shedding its pollen on a viscid disk which is located on the style at the point of contact. Here the pollen adheres till scraped away in the operation next to be described.

"A bee alights on the platform formed by one or more of the lower staminodia, thursts its beak forward to secure the drop of nectar, and in doing so strikes the sensitive tentacle. The pistil suddenly coils and strikes the bee. First the stigma is brought in contact, and scrapes off any pollen that may have been previously deposited on the bee at that point. Then, as the style continues coiling, it brings the viscid disk in contact with the same point of the bee's body, depositing more pollen, which will be scraped off in another flower visited. In Maranta and Calathea, the visitor is probably a bee of the size of the hive-bee, and the pollen would be deposited on the abdominal surface of its body. The visitors to the Thalia flower are of the larger bumble-bee type, and the individual receives the pollen deposit at the base and on one side of its beak. Previous to the coiling of the style, the stigma is covered by one or more of the lower staminodia; at the end of the operation, in each case, it is again covered securely, so that it has but one chance to become pollinated. After pollination, the flower rapidly withers."—WM. TRELEASE.